



# Protecting Black-Footed Ferrets and Prairie Dogs Against Sylvatic Plague

Scientists at the USGS National Wildlife Health Center (NWHC), in collaboration with colleagues at other federal agencies and the University of Wisconsin, are developing and testing vaccines that can be used to protect black-footed ferrets and prairie dogs against plague. The black-footed ferret is commonly regarded as the most endangered mammal in North America, and sylvatic plague is a major impediment to its recovery. The three prairie dog species (Gunnison's, black-tailed, and white-tailed prairie dogs), upon which the ferret depends for food and whose burrows they use for shelter, have been drastically reduced from historical levels, resulting in the near extinction of the ferret. All three species are considered 'at risk' and have been petitioned for listing as 'threatened' or 'endangered' by the U.S. Fish and Wildlife Service (FWS). Additionally, the Utah prairie dog is listed as threatened and the Mexican prairie dog is considered endangered in Mexico.



Utah prairie dog (NWHC).

Like the black-footed ferret, all five prairie dog species are highly susceptible to plague and regularly experience outbreaks with devastating losses. Controlling plague outbreaks is a vital concern for ongoing recovery programs and conservation efforts for both prairie dogs and ferrets.

## Sylvatic Plague – A Continued Threat to North American Wildlife

Sylvatic plague, caused by *Yersinia pestis*, is a bacterial disease transmitted by fleas that afflicts many mammalian species, including humans. For many species of wildlife, plague mortality is a serious conservation issue. In fact, more than half of North American rodent species considered of conservation concern by the International Union for Conservation of Nature reside within the range of plague outbreaks in the western U.S. The bacterium that causes plague was inadvertently introduced into North America in the early 1900's. Because it is foreign to the evolutionary history of North American mammals, most species have little or no immunity and succumb quickly to the disease. Prairie dogs are particularly susceptible to plague and suffer high mortality rates (90% or more) during outbreaks, often resulting in local or even regional extinctions. Black-footed ferrets are also highly susceptible to plague, contracting the disease by ingestion of infected prey or via bites from infected fleas. But even if they manage to avoid plague exposure, prairie dog population declines that result from a severe outbreak are devastating for ferret populations as they rely almost exclusively on prairie dogs for their survival. Plague is now considered endemic throughout the western states, but was newly discovered in the Conata Basin, South Dakota, in May 2008. This site is the most successful black-footed ferret reintroduction site in the U.S. and was considered plague-free until this outbreak.

### The Black-Footed Ferret, Once Thought Extinct, Returns to the Wild

The black-footed ferret once occurred across a large mid-continent area from southern Canada to northern Mexico. The ferret depends almost exclusively on prairie dogs for food and for shelter in their burrows. Over the past century, prairie dog populations, and ferrets by extension, have drastically declined due to habitat loss, poisoning, and devastating outbreaks of sylvatic plague. Prairie dogs numbers have been reduced by over 95%.



Historical range   
Last known range •  
**Historical range of the black-footed ferret.**

Once presumed to be extinct, a wild population of ferrets was discovered in 1981 in Wyoming. Unfortunately, this last colony succumbed to disease, but not before it provided a few animals to start a captive breeding effort that to date has produced over 7,000 young. Six facilities now maintain separate, intensively managed, captive ferret populations totaling around 290 animals.

Since 1991, over 2,600 ferrets have been reintroduced into the wild across the western U.S. and Mexico, and Canada. Ferret numbers in the wild total about 1,000 individuals as of fall 2010, with perhaps half surviving to breed each spring. Although highly successful so far, the ferret recovery program will not be complete until larger numbers of ferrets exist in the wild and their populations are sustainable.

One of the biggest obstacles to fulfilling this goal is sylvatic plague, a disease highly lethal to both prairie dogs and ferrets. In May 2008, plague was discovered at Conata Basin, South Dakota for the first time, where the largest breeding population of black-footed ferrets resided. Nearly two-thirds of the prairie dogs at Conata Basin died from plague along with about one-third (100) of the ferrets. Efforts to control the outbreak included pesticide application, and trapping and vaccination of ferrets, but these are costly, labor-intensive, short-term solutions. Consequently, continued research into the development of oral vaccines to prevent plague in prairie dogs is needed.



U.S. Fish and Wildlife Service

## Successful Immunization of Black-Footed Ferrets

Scientists at NWHC have demonstrated in the laboratory that vaccination can protect black-footed ferrets from plague.



**USGS scientist injects a vaccine into a black-footed ferret (NWHC).**

Collaborative field studies with the FWS and the USGS Fort Collins Science Center have verified that vaccination can improve ferret survival in the wild. The plague vaccine used for ferrets is an injectable protein, developed for humans by the U.S. Army Medical Research Institute for Infectious Disease.

To provide full immunity against plague, two injections of the vaccine,

spaced about 30 days apart, are required. Since 2008, all captive-born ferrets released into the wild as part of the recovery program receive two doses of plague vaccine prior to release. This vaccine was also used to protect wild-born ferrets during the plague outbreak in the Conata Basin. However, field vaccination is difficult because of the time-consuming tasks of finding, capturing, handling and injecting free-ranging animals. Unfortunately, immunization of ferrets against plague will not prevent the potential loss of their prey base – prairie dogs. Ultimately, successful management of plague in ferrets will depend on managing the disease in prairie dogs.

## Vaccine-Laden Bait: A New Method for Field Application

Current efforts to halt the spread of plague in prairie dog colonies typically rely on dusting individual prairie dog burrows with



**FWS scientist sprays pesticide on a prairie dog burrow to kill plague-carrying fleas (Randy Matchett, FWS).**

pesticides that kill plague-infected fleas. However, this pesticide application is labor intensive, costly and difficult to sustain over time. As an alternative approach, scientists at NWHC, in collaboration with the University of Wisconsin–Madison, have developed a plague vaccine for prairie dogs that can be delivered via oral bait.

Laboratory studies have shown that voluntary consumption of this vaccine-laden bait by different prairie dog species results in significant protection against plague infection. Work has now shifted to optimizing baits and distribution methods for field delivery of the vaccine. Peanut butter-flavored baits were shown to be preferred by prairie dogs in laboratory studies, and preliminary field studies using baits without vaccine have shown rates of uptake by wild prairie



**A variety of vaccine-laden oral baits (NWHC).**

dogs > 90% within 3-4 days of application. The vaccine remains viable within the baits for up to 7 days at 28°C. Additional work is in progress or planned to test dispersal of baits from planes or vehicles and to further confirm the safety of the vaccine in non-target animals, such as other rodents and domestic animals. The ultimate goal is to license vaccine-laden bait for field application in targeted areas where black-footed ferrets are living or are released as part of the recovery program. It could also be used in national parks or urban areas where the potential for human exposure to plague-infected rodents is high. Using vaccine-laden bait provides effective immunity against plague that would allow treatment of more prairie dogs, with less labor and expense than dusting. Better protection of prairie dogs would minimize the risk of disease transfer to ferrets, aid in prairie dog conservation and protect public health. Developing effective vaccines for ferrets and prairie dogs will enhance recovery of the endangered black-footed ferret.



**Black-tailed prairie dog in New Mexico (J. Chipault, NWHC).**

## Oral Plague Vaccine (OPV) Work Group Established

Under the direction of the Executive Committee of the Black-footed Ferret Recovery Implementation Team, a work group was established in December 2010 to complete development and delivery of the OPV as a management tool to combat plague in prairie dogs and promote the recovery of the black-footed ferret. As part of the strong interagency foundation of the Work Group, the Western Association of Fish and Wildlife Agencies will play a vital role in overseeing the OPV project. The OPV Work Group will draw from the broad expertise and experience of governmental (federal, state, and tribal) and nongovernmental partners to promote and coordinate the use of OPV for the conservation and recovery of black-footed ferrets and prairie dogs in targeted locations.

### For additional information, please contact:

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